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Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

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In the Matter of)

1998 Biennial Regulatory Review--)
Amendment of Part 18 of the)
Commission's Rules to Update)
Regulations For RF Lighting Devices)

ET Docket No. 98-42

JOINT REPLY COMMENTS

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EXECUTIVE SUMMARY

L/Q Licensee, Inc., Globalstar, L.P., and AirTouch Communications, Inc., are filing these Joint Reply Comments to respond to the recommendations of Fusion Lighting filed in its comments and to propose rules to protect MSS Above 1 GHz downlinks operating in 2483.5-2500 MHz band.

Fusion claims that the operation of its microwave lamps is similar to operation of microwave ovens. However, because of the higher radiated energy levels of Fusion lamps and their anticipated position on outdoor elevated structures, these lamps, unlike microwave ovens, are likely to cause signal degradation for a Globalstar MET within a relatively large area near the lamp. Given that the lamps may be "on" for long periods of time, deployment of Fusion lamps at the proposed parameters could create a preclusion zone around each lamp in which Globalstar METs would not provide the desired service.

In order to protect MSS METs from signal degradation, the Commission should adopt an in-band emissions limit at least as stringent as the out-of-band emissions limit proposed for frequencies above 1000 MHz. A field strength limit of 100 microvolts per meter in the 2483.5-2500 MHz band would significantly reduce the potential for interference into Globalstar METs. A high pass filter should also be required on Fusion lamps that would reduce the microwave energy output without measurably attenuating the desired visible radiation.

Protecting MSS Above 1 GHz is consistent with the Commission's policies on introduction of new services. Just four years ago, the Commission recognized the

considerable public interest benefits to be provided by MSS systems. The Commission does not establish a new service such as MSS Above 1 GHz specifically to achieve identified public interest objectives only to degrade the licensees' ability to serve the public by allowing deployment of known sources of interference. Moreover, the Commission has recognized that the impact of Fusion lamps was unanticipated in the MSS Above 1 GHz proceeding four years ago. It is now too late for MSS licensees to redesign their equipment to account for unanticipated interference from these lamps.

RR 752 states that radio services operating in the ISM band must accept interference from ISM devices. But, Fusion cannot claim the protection of RR 752 because it admits that Fusion lamps do not comply with the Part 18 rules. Also, the studies presented in 1994 to the Commission demonstrating that microwave ovens would not have an impact on MSS Above 1 GHz METs are inapplicable. The many differences between microwave ovens and Fusion lamps indicate that these studies cannot be used to evaluate the impact of microwave lighting.

The request by Fusion to ignore the impact of its lamps on MSS Above 1 GHz systems is inconsistent with the Commission's reasoned and careful approach to introduction of new services and new devices into bands used by licensed radio services. Therefore, the only reasonable approach is for the Commission to develop rules that permit the introduction of Fusion lamps without jeopardizing the integrity of MSS downlinks operating in the 2483.5-2500 MHz band.

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JOINT REPLY COMMENTS

L/Q Licensee, Inc., Globalstar, L.P., and AirTouch Communications, Inc., pursuant to Section 415 of the Commission's Rules, hereby respond to the comments filed in the above-referenced docket regarding revisions to Part 18 governing Industrial, Scientific and Medical ("ISM") devices. Specifically, the Commission has proposed to adopt rules to facilitate deployment of microwave lamps developed by Fusion Lighting ("Fusion") that would operate in the 2400-2500 MHz ISM band ("Fusion lamps").¹

L/Q Licensee, Inc. ("LQL") is the licensee of the Globalstar™ Mobile-Satellite Service ("MSS") Above 1 GHz satellite system.² LQL is authorized to use the 2483.5-2500 MHz band for the user downlink in its MSS Above 1 GHz system.

¹ See Notice of Proposed Rulemaking, FCC 98-53 (released April 9, 1998) ("NPRM").

² See Loral/Qualcomm Partnership, L.P., 10 FCC Rcd 2333 (Int'l Bur. 1995). The license was later assigned to LQL, a wholly-owned subsidiary of LQP.

Globalstar, L.P., a Delaware limited partnership, holds the right to offer capacity on the Globalstar system and owns and operates the international MSS business.

AirTouch Communications, Inc. ("AirTouch"), is the United States service provider for Globalstar through its subsidiary AirTouch Satellite Services U.S., Inc. Based on the significant potential for harmful interference into Globalstar Mobile Earth Terminals ("METs") from the operation of Fusion lamps, LQL, Globalstar and AirTouch all have a substantial interest in the regulations adopted in this proceeding.

I. BACKGROUND

The purpose of the NPRM is "to review and update" thirteen-year old rules governing RF lighting devices. In its comments, Fusion, the principal proponent of microwave lamps, has already conceded that its new lamps cannot meet the currently applicable Part 18 rules. See Fusion Comments, at 3-6. The Commission itself has recognized that the in-band emissions from Fusion lamps may cause significant interference into MSS receivers operating in the 2483.5-2500 MHz band, and that such interference was not anticipated when the allocation for MSS was adopted or when the MSS systems were authorized. NPRM, ¶ 13. Therefore, the Commission is seeking recommendations that will allow the commercial sale of Fusion lamps without threatening the MSS allocation at 2483.5-2500 MHz.

As Fusion pointed out in its comments, LQP took the position in a previous proceeding that ISM devices operating in the 2400-2500 MHz band would not pose a

significant interference threat to METs operating at 2483.5-2500 MHz, and that the design of the Globalstar system and the operational environment of then-known ISM devices helped ensure adequate protection for MSS.³ When the Commission sought comment on proposed rules governing ISM-MSS sharing, LQP submitted a study of emissions from microwave ovens which indicated that the impact on MSS METs would not be significant.⁴

However, based on currently available information, Fusion lamps present a significant, new and unanticipated source of interference into MSS. Accordingly, LQL, Globalstar and AirTouch are concerned that widespread deployment of such lights with the parameters proposed in the NPRM would seriously impair MSS operations and undermine the public benefits from MSS Above 1 GHz services. Indeed, LQP anticipated such a problem in the study which it submitted to the NRC:

The potential interference from ISM devices, as more of these devices are deployed may increase. Further studies on levels of emissions under various conditions should be conducted in order to determine if additional measures of protection for the MSS systems are required.⁵

³ See Report of the MSS Above 1 GHz Negotiated Rulemaking Committee (Apr. 6, 1993), Addendum Submitted by Loral Qualcomm Satellite Services, Inc., regarding "Sharing with Services Other than ARNS and RAS." The MSS Above 1 GHz Negotiated Rulemaking Committee ("NRC") was unable to reach consensus on the impact of ISM on MSS. NRC Report, § 3.4.9.

⁴ See Amendment of the Commission's Rules Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.-2500 MHz Frequency Bands, 9 FCC Rcd 5936, 5991 (1994).

⁵ LQP Addendum, supra note 3, at 4.

The deployment of Fusion lamps cannot be permitted until additional study of emissions from ISM devices confirms that MSS is adequately protected.

II. WIDESPREAD DEPLOYMENT OF FUSION LAMPS AS PROPOSED IN THE NPRM WOULD LIKELY RESULT IN HARMFUL INTERFERENCE INTO THE GLOBALSTAR SYSTEM.

Globalstar has studied the impact of the deployment of Fusion lamps on MSS Above 1 GHz with the information currently available. As discussed in the attached Technical Comments, Fusion lamps would have a significantly greater impact on MSS receivers at 2483.5-2500 MHz than microwave ovens. This result is due to the much higher energy levels of Fusion lamps and their likely positioning on outdoor elevated structures. See Technical Comments, ¶¶ 1-4.

In 1994, LQP determined that the radiated energy from a microwave oven would probably result in unacceptable interference to a Globalstar handset at a receive signal level of -90 dBm and in signal degradation at -95 dBm.⁶ Using these same figures for Fusion lamps, the attached Technical Comments demonstrate that, considering only the MET in relation to the Fusion lamp, a Globalstar MET would likely suffer signal degradation within 600 meters of a Fusion lamp. See Technical Comments, ¶¶ 5-6. Given that Fusion lamps may be "on" continuously or for long periods of time, deployment of Fusion Lamps at the

⁶ Comments of Loral/Qualcomm Partnership, L.P., CC Docket No. 92-166, Technical Appendix, § 2.3.3 (filed May 5, 1994).

proposed parameters could result in creation of a preclusion zone of about 600 meters around each Fusion lamp in which Globalstar handsets would not provide the desired service. Installation of Fusion lamps in street lights, for example, could have the effect of precluding the use of Globalstar METs in much of an urban area.

In order to protect MSS METs from signal degradation, the Commission should adopt an in-band emissions limit at least as stringent as the proposed out-of-band emissions limit for above 1000 MHz.⁷ A field strength limit of 100 microvolts per meter in the 2483.5-2500 MHz band would significantly reduce the potential for interference into Globalstar METs. See Technical Comments, ¶ 7. Moreover, it appears likely that a high pass filter could be employed on Fusion lamps that would reduce the microwave energy output to acceptable levels without measurably attenuating the desired visible radiation. See id., ¶ 8. Such measures would promote the Commission's goals of facilitating development of Fusion lamps and allowing commercial deployment of MSS Above 1 GHz services.

III. THE PUBLIC INTEREST REQUIRES THAT MSS ABOVE 1 GHZ METS BE PROTECTED FROM HARMFUL INTERFERENCE FROM FUSION LAMPS.

The Commission's charter is "to make available . . . to all the people of the United States . . . a rapid, efficient, Nation-wide, and world-wide wire and radio

⁷ See NPRM, App. C, proposed § 18.305(c). The Commission should revise Section 18.305(a) to make clear that there are in-band field strength limits for the 2483.5-2500 MHz band.

communication service with adequate facilities at reasonable charges.”⁸ As the Commission has noted, RF lighting does not provide a communications service.⁹ On the other hand, MSS Above 1 GHz provides a new form of communications that has been found to serve the public interest. Just four years ago, the Commission recognized the considerable public interest benefits to be provided by MSS systems, including “a universally available world-wide cellular-like radiotelephone service offering voice, data and facsimile services. . . . at relatively low cost.”¹⁰ The Commission does not establish a new service such as MSS Above 1 GHz specifically to achieve identified public interest objectives only to degrade the licensees’ ability to serve the public by allowing deployment of known sources of interference. As another potentially affected satellite service provider noted in comments on Fusion lamps: “[I]t would be inconsistent with the public interest for the agency knowingly to authorize a technology that will undermine other radio services.”¹¹

The Commission, its staff, other governmental entities and many private parties worked very hard, at substantial expense, to develop this new, innovative

⁸ 47 U.S.C. § 151.

⁹ See Overall Revision of Part 18 Governing Industrial, Scientific and Medical Equipment, 69 FCC 2d 876, 876-77 (1978) (Part 18 equipment generates and uses RF energy for purposes other than communications) (“ISM NPRM”).

¹⁰ Amendment of Section 2.106 of the Commission’s Rules to Allocate the 1610-1626.5 MHz and the 2483.5-2500 MHz Bands for Use by the Mobile-Satellite Service, Including Non-geostationary Satellites, 9 FCC Rcd 536, 539 (1994).

¹¹ Satellite CD Radio Comments, at 6; see also Metricom Comments, at 3-4 (discussing potential adverse impact on existing Part 15 devices from introduction of a new source of interference in the 2400-2500 MHz band).

consumer-oriented MSS service. The allocation for MSS Above 1 GHz was adopted six years ago by the ITU due to the efforts of the Commission, the United States delegation, and various satellite companies that had a vision of a new form of global telecommunications. Following the 1992 WARC, the Commission adopted the allocation at 2483.5-2500 MHz into the U.S. Table of Allocations. Subsequently, the Commission adopted rules for MSS Above 1 GHz, and licensed four entities to use these frequencies to provide the proposed new services.

The space and earth station facilities designed to use the 2483.5-2500 MHz downlink for MSS are being deployed now. Globalstar is in the process constructing and launching 56 satellites for its MSS constellation; eight of the satellites have been launched; three additional launches of 12 satellites each are scheduled before the end of 1998. Commercial service is anticipated to commence in the United States within one year. Design of the Globalstar METs is near completion, and AirTouch's application to use the handsets in the United States is pending before the Commission.¹² In addition, administrations around the globe are preparing the way for implementation of these services by adopting arrangements governing worldwide transportation and use of "Global Mobile Personal Communications by Satellite" handsets, which the Commission currently has under consideration in

¹² See Application of AirTouch Satellite Services US, Inc., File No. 1367-DSE-P/L-97.

another proceeding.¹³ It would contravene important Commission and international policies as well as the public interest benefits served by the operation of MSS Above 1 GHz systems for the Commission now to authorize deployment of Fusion lamps as proposed in the NPRM.

IV. THE COMMISSION MUST REJECT FUSION'S SUGGESTION THAT NO PROTECTION FOR MSS IS WARRANTED.

In its comments, Fusion argues that the impact of Fusion lamps on MSS Above 1 GHz should be ignored for two reasons. First, RR 752 states that radio services operating in the ISM band must accept interference from ISM devices. Second, in 1994, studies were presented to the Commission demonstrating that microwave ovens would not have an impact on MSS Above 1 GHz handsets. See Fusion Comments, at 10-13. Both arguments are misguided and wrong.

First, Fusion cannot claim the protection of RR 752 because it admits that Fusion lamps do not comply with the applicable Part 18 rules. RR 752 reflects the fact that ISM devices have been granted co-primary status within the ISM band. However, as unlicensed devices, they are still strictly regulated so as to minimize

¹³ See Amendment of Parts 2, 25 and 68 of the Commission's Rules to Further Streamline the Equipment Authorization Process for Radio Frequency Equipment, Modify the Equipment Authorization Process for Telephone Terminal Equipment, Implement Mutual Recognition Agreements and Begin Implementation of the Global Mobile Personal Communications by Satellite (GMPCS) Arrangements, FCC 98-92 (released May 18, 1998).

disruption to radio communication services.¹⁴ The Commission cannot authorize deployment of a new ISM device that would preclude certain radio communication services based on an historic policy that grants ISM devices some protection because they are designed not to pose a significant threat to licensed services.

Second, the studies referenced by Fusion were conducted by LQP to evaluate the impact of microwave ovens – not Fusion lamps – on MSS services. In addition to the differences in operating parameters noted in the NPRM, there are many differences between microwave ovens and Fusion lamps which indicate that LQP's studies cannot be used to evaluate the impact of microwave lighting.

- Microwave ovens are, for the most part, operated indoors where building attenuation would provide some protection for MSS handsets from in-band emissions. Fusion lamps are being touted for use in various elevated outdoor venues, such as parking lots, street lights and stadiums, where there would be no such protection.
- Microwave ovens are designed to retain energy to cook food within the oven, and so, do not produce significant emissions. Fusion lamps are designed to radiate light energy, and, as a consequence, significant microwave energy is also radiated rather than retained within the device.¹⁵
- Microwave ovens are generally used only intermittently, at certain times of the day for relatively brief periods, and would not pose any threat to MSS handsets when not in use. Fusion lamps would be on

¹⁴ See 47 C.F.R. § 18.115(a); FCC Regulations Concerning RF Lighting Devices, 63 RR 2d 1714, 1717-18 (1987); Overall Revision of the Rules Regarding Industrial, Scientific and Medical (ISM) Equipment Under Parts 0, 2 and 18, 58 RR 2d 1096, 1101-02 (1985) ("ISM Rules Order").

¹⁵ Microwave energy sources may also produce health risks from human exposure, and the Commission has adopted guidelines for permissible exposure limits. See 47 C.F.R. §§ 1.1301-1319.

continually, or for a substantial period of time, resulting in a continuous increase in the noise floor for MSS handsets.

- Even when operating, microwave ovens are not always operated on full power. In contrast, Fusion lamps, when in service, would likely be operating at 100% duty cycle.
- Microwave ovens are low-level radiators due to Food and Drug Administration regulations, and do not occur in concentrations. Fusion lamps are sources of significantly higher radiation than microwave ovens and would be deployed in potentially large groups (e.g., in mall parking lots, on street lights).
- Because of their relatively low concentration, microwave ovens would not result in continuous interference into a mobile handset; that is, the MET user would likely pass by quickly any area in which it would be experiencing harmful emissions. On the hand, it could be difficult to escape harmful emissions from Fusion lamps located on elevated posts outdoors in parking lots and on streets.
- MSS METs would generally not be used indoors near microwave ovens, primarily because other communications sources are likely available. In contrast, the primary use of MSS METs would be in areas where they may be affected by outdoor lighting facilities. Of particular concern would be vehicle-mounted units.

None of these differences between microwave ovens and Fusion lamps were taken into account in the LQP survey of the impact of ISM devices on MSS. Therefore, contrary to Fusion's comments, there is nothing in the record of the MSS Above 1 GHz proceeding that suggests that MSS Above 1 GHz systems can tolerate interference from Fusion lamps.

It should be noted that, during the MSS Above 1 GHz Negotiated Rulemaking Committee, the working group examining interference from ISM devices took into account the increasing use of microwave powered ultraviolet

lamps.¹⁶ The report states that calculations from Fusion Systems Corporation indicate that a 24 kilowatt bank of these lamps emits 35 watts of microwave energy in the 2400-2500 MHz band, and that “stringent restrictions” should be placed on these lighting systems. These calculations indicate that 0.15% of the input power of the microwave powered ultraviolet lamps comes out as microwave energy. The RF lighting devices which are the subject of the NPRM use 1% of the 1500 watts of input power to produce 15 watts of microwave output power, an increase of approximately 600% over the anticipated impact of ultraviolet lamps.

V. THE COMMISSION’S POLICIES ON DEVELOPMENT OF NEW RADIO SERVICES AND UNLICENSED DEVICES DICTATE MORE STRINGENT RESTRICTIONS ON EMISSIONS FROM FUSION LAMPS.

Despite the fact that Fusion lamps were not designed to meet the applicable Part 18 rules and would introduce significant new in-band interference into licensed radio services, Fusion has taken the position that MSS Above 1 GHz is not entitled to any deference, and the Commission should simply adopt rules without regard to their impact on MSS. See Fusion Comments, at 13-15.

The course of action recommended by Fusion is inconsistent with the Commission’s existing policies on introduction of new radio communications services and radio frequency equipment. When the Commission makes spectrum

¹⁶ NRC Report, Att. C, “Sharing with Services Other Than ARNS and RAS,” § 4.8.

available for a new radio service, such as MSS Above 1 GHz, its policy is to ensure access to relatively interference-free spectrum to promote the development (if not economic success) of the new services. This policy is reflected in both the allocation of spectrum and the technical rules adopted for new services.

For example, in proposing an allocation of spectrum for new Personal Communications Services ("PCS"), the Commission stated that "it [is] important that each PCS licensee be provided enough spectrum to be competitive with existing telecommunications services such as cellular, SMRs and others."¹⁷ Similarly, the Commission has proposed to assign an MSS system first priority for access to spectrum in the lower L-band (1525-1544/1626.5-1645.5 MHz) because the Commission "can and should . . . take reasonable and appropriate steps to ensure that our licensees have a fair opportunity to compete."¹⁸ These allocation decisions were thus premised on the principle that the new licensees must be afforded a fair opportunity to provide the new service.

Similarly, in adopting technical rules for the Wireless Communications Service ("WCS"), the Commission provided interference protection for the new Satellite Digital Audio Radio Service ("Satellite DARS") from WCS out-of-band

¹⁷ Amendment of the Commission's Rules to Establish New Personal Communications Services, 7 FCC Rcd 5676, 5691 (1992).

¹⁸ Establishing Rules and Policies for the Use of Spectrum for Mobile Satellite Service in the Upper and Lower L-band, 11 FCC Rcd 11675, 11681 (1996). LQL, Globalstar and AirTouch do not agree that the referenced proposal is proper. However, it does reflect the Commission's often-articulated view that new services must be given a chance to develop a competitive base.

emissions. The Commission reasoned that “if Satellite DARS in this spectrum is subject to excessive interference, the service will not be successful and the American public will not benefit from the service.”¹⁹

There was also a concern that WCS would cause blanketing interference into receivers operating in the existing Instructional Television Fixed Service (“ITFS”) and Multipoint Distribution Service (“MDS”). Accordingly, the Commission adopted limits for WCS operating power to protect against interference into existing ITFS and MDS receivers and also adopted specific procedures for curing actual interference. The Commission reasoned that the ITFS and MDS receivers “were designed with different expectations about the extent and nature of use of nearby bands.”²⁰

The Commission was faced with circumstances similar to those regarding MSS Above 1 GHz just last year when it was asked to adopt rules permitting deployment of unlicensed Part 15 devices in the 5150-5250 MHz band which had been previously allocated by the ITU for MSS feeder links.²¹ Unlike ISM devices, Part 15 devices must operate on a secondary basis; but, the Commission had proposed a “safe harbor” which would have required MSS feederlinks to accept a certain level of interference from U-NII devices. Ultimately, after studies had been

¹⁹ Amendment of the Commission’s Rules to Establish Part 27, the Wireless Communications Service, 12 FCC Rcd 3977, 3992 (1997).

²⁰ Id. at 3984.

²¹ See Amendment of the Commission’s Rules to Provide for Operation of Unlicensed NII Devices in the 5 GHz Frequency Range, 12 FCC Rcd 1576 (1997).

presented to the Commission of the aggregate effect of the deployment of U-NII devices, the Commission decided to adopt stringent power limits for the new devices in the 5150-5250 MHz which would accommodate the needs of U-NII manufacturers to develop devices but would also protect MSS operations in the band, i.e., to permit robust development of unlicensed devices without significant impact on other users.²²

As illustrated by the Commission's action in the U-NII proceeding, its policy to promote successful development of new services is particularly apt when there is a potential for interference from unlicensed devices into radio communication services. Section 301 of the Communications Act of 1934, as amended, requires that "[n]o person shall use or operate any apparatus for the transmission of energy or communications or signals by radio . . . except under and in accordance with this Act and with a license in that behalf granted under the provisions of this Act."²³ The Commission has excepted low power radio transmitters from the licensing requirement of Section 301 because such devices are generally operated at sufficiently low power so that there is little or no potential for interference into radio communications services.²⁴ The statutory requirement that Part 18 devices

²² Id. at 1609-10.

²³ 47 U.S.C. § 301 (emphasis supplied).

²⁴ See ISM Rules Order, 58 RR 2d at 1096-97; ISM NPRM, 69 FCC 2d at 879-80; see also Amendment of Part 15 of the Commission's Rules Governing Restricted Radiation Devices, 13 RR 1543, 1544 (1955) (Part 15 devices are an exception to Section 301 as long as they operate at low radiation limits).

operate on a non-interference basis is set forth in Section 18.111(b) of the Commission Rules. Although there are exceptions to this rule for operations within designated ISM bands,²⁵ the legislative policy underlying Section 301 still requires the Commission to make every effort to forestall harmful interference into licensed services from unlicensed services.

Fusion's proposals are inconsistent with the Commission's reasoned and careful approach to introduction of new services and new devices into bands used by licensed radio services which it followed in the PCS, MSS, WCS and U-NII proceedings described above. As in the WCS proceeding, the Commission has recognized in the NPRM that the impact of Fusion lamps was unanticipated in the Above 1 GHz proceeding. It is now too late for MSS licensees to redesign their equipment to account for unanticipated interference from these lamps.²⁶ Therefore, if the Commission wishes to consider authorizing the introduction of Fusion lamps which do not meet existing Part 18 rules, it must do so without jeopardizing the integrity of the 2483.5-2500 MHz band for MSS downlinks.

²⁵ See 47 C.F.R. § 18.111(c).

²⁶ See Satellite CD Radio Comments, at 7 ("Although no licensee . . . should expect a pure, interference free environment, neither should a licensed service provider—especially one that has committed and/or invested over one half billion dollars to date in its infrastructure—be required to accept significant degradation in its signal quality from unlicensed devices"); American Mobile Radio Corp. Comments, at 2 (noting cost burden on AMRC if it were required to redesign receivers to filter out RF lighting emissions).

VI. NO REVISIONS TO PART 18 CAN BE ADOPTED WITHOUT STUDYING THE IMPACT OF FUSION LAMPS ON LICENSED RADIO COMMUNICATION SERVICES.

The comments filed in this proceeding make clear that Fusion lamps are a potential source for significant harmful interference into MSS Above 1 GHz, Satellite Digital Audio Radio Service,²⁷ the Amateur Radio Service,²⁸ and unlicensed Part 15 devices.²⁹ To protect MSS Above 1 GHz from interference, the Commission must at least adopt in-band field strength limits and require filters of Fusion lamps. Fusion has indicated that there is a cost impact on such action. See Fusion Comments, at 4. If this is a concern, then LQL, Globalstar and AirTouch recommend that the Commission hold this proceeding in abeyance while further studies and field tests are performed to determine whether other remedies may be less costly for Fusion lamps.³⁰ LQL, Globalstar and AirTouch will cooperate with such efforts.

²⁷ See American Mobile Radio Corp. Comments; Satellite CD Radio Comments.

²⁸ See American Radio Relay League Comments.

²⁹ See Comments of Aironet Wireless Communications, Metricom, Part 15 Coalition, Symbol Technologies, 3Com, and Wireless LAN Alliance.

³⁰ However, the Commission's mandate is to adopt rules in the public not private interest. Fusion has not indicated that the cost impact would adversely affect the availability of its lamps to the public.

VII. CONCLUSION

For the reasons set forth above, LQL, Globalstar and AirTouch recommend that the Commission adopt in-band emissions limits for Fusion lamps in the 2483.5-2500 MHz band and require filters on Fusion lamps to protect MSS METs from interference. If additional studies are needed, this proceeding should be held in abeyance while the effect of Fusion lamps can be studied, and a date should be set for filing additional comments reflecting such studies.

Respectfully submitted,

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Dated: August 24, 1998

**TECHNICAL
COMMENTS**

Technical Comments on RF Lighting Devices Operating in the 2400 - 2500 MHz ISM Band

Introduction — These Technical Comments have been prepared to accompany the reply comments of L/Q Licensee, Inc., Globalstar, L.P., and AirTouch Communications, Inc., in response to the comments on the proposals in ET Docket No.98-42, specifically regarding the proposed changes to the Part 18 rules to accommodate the Fusion RF lighting device. The Globalstar MSS Above 1 GHz system is authorized to use the 2483.5 - 2500 MHz band for its subscriber downlinks.

In its comments, Fusion has suggested that Globalstar handsets are entitled to no greater protection from Fusion lights operating in the 2400 - 2500 MHz band than from microwave ovens operating in the same band based on the Commission's existing rules and studies conducted of microwave ovens during the "Big LEO" rulemaking. Based on currently available information, Fusion lights present a significantly different and greater threat of interference into the Globalstar system than microwave ovens. The reason for this difference and the impact of Fusion lights are discussed below. Since the Mobile Satellite Service was designed and authorized to use the 2483.5 - 2500 MHz band prior to proposals for Rules applicable to Fusion RF lighting devices in the ISM band, Globalstar is submitting technical proposals for microwave lamps to allow compatible operation of MSS user terminals and Fusion lamps.

1. The RF lighting devices manufactured by Fusion Lighting of Los Gatos, California are vastly different from microwave ovens with respect to potential interference to the Globalstar MSS System. This difference stems from two basic facts; 1) RF lighting devices operating in the ISM band emit more microwave energy than do microwave ovens, 2) RF lighting devices will be deployed outdoors, often in elevated locations, and hence do not benefit from similar microwave energy dissipation due to buildings, terrain and foliage.

2. The RF lighting devices proposed by Fusion lighting use a magnetron, a microwave vacuum tube suitable for generating large amounts of microwave energy, to excite a mixture of sulfur and argon gas to generate light. There is little evidence of shielding or other methods used to prevent the radiation of microwave energy from these devices as there is with microwave ovens, hence it is expected that the radiation from these devices will exceed that of microwave ovens.

Microwave ovens are manufactured to cook whatever is placed inside them. In light of this, microwave ovens are made to keep the microwave energy inside so

that the energy can be absorbed by the food and hence cooked. "Choke Flange" doors and shielding are used to insure that little microwave energy leaks from an oven. In addition, the microwave energy from an oven can also "cook" a human if the human is exposed to enough of the energy. Government regulations limit the amount of energy leakage from microwave ovens, thus guarding humans from being exposed to a potential radiation hazard.

Metricom Inc. in its comments (Metricom at 10) estimates that the power flux density of the Fusion RF lighting device exceeds that of a microwave oven by a factor of approximately nine. Given this estimate, each RF lighting device would produce 9.5 dB more power than a microwave oven.

Magnetrons used in RF lighting devices or microwave ovens do not have precision frequency control as do all telecommunications transmitters. As a consequence, the output frequency of the magnetron used to excite an RF lighting device could occur unpredictably over a broad range. The power spectrum of these devices is tens of megahertz wide and in addition to its noise-like nature it could, in addition, be modulated by power supply frequency components and their harmonics. The closer the magnetron output frequency is to the Globalstar user terminal receive frequency, the more interference it will cause.

Microwave ovens are used in the greatest proportion by individual households. These households use these oven intermittently for short periods of time. On the other hand, lights are used for illumination, hence they are on whenever and wherever it is dark. Lights used for outside illumination are on continuously for hours at a time. While microwave ovens used for professional purposes may operate on a continuous or near continuous basis, these types of ovens are few in number in comparison to household microwave ovens and thus do not pose an interference threat to Globalstar user terminals. These professional ovens, further, are limited to emission levels similar to those required of household ovens.

Based on the facts given above, it is apparent that RF lighting devices are a significant and new form of interference into MSS user terminals that will emit more microwave energy than microwave ovens and will do it for longer periods of time.

3. Since it is the purpose of RF lighting to illuminate, these devices can and most likely will be mounted on outdoor light standards that can be used to light roadways, parking lots, athletic fields and other areas requiring illumination. Implied is the placement of these RF lighting devices in elevated locations, in view of large areas of the surroundings. The easier the lamp is to see, the greater the area that can be illuminated.

Being "in view" of large areas of the countryside is an attribute that is also advantageous for radio transmitters of all types. Transmitters on board satellites

can radiate large portions of the earth and thus allow communication over these areas. Cellular telephone and PCS systems utilize antennas of moderate elevation in order to provide service over large areas. The primary reason that mobile satellite communications systems and PCS and cellular telephone systems do not share the same frequency bands is that signals coming from each system would interfere with each other if the antenna coverage areas were the same. Fusion lamps would have the same effect on a communications Services, satellite or terrestrial, as an interfering radio transmitter.

It can be easily seen that communications systems utilizing the same frequencies as those emitted by RF lighting devices run the risk of interference when being used in areas lit by such devices.

4. The combination of greater emitted energy and installation in outdoor elevated locations make the RF lighting device a potentially formidable source of interference to the Globalstar system. The measurements and analysis performed by Globalstar for inclusion in the proceedings of the Negotiated Rulemaking (NRM) on Mobile Satellite Service (MSS) systems operating in the 1610-1626.5 MHz and 2483.5-2500 MHz Bands indicated that the existing interference in the 2483.5-2500 MHz band was not a threat to Globalstar system operation. The fielding of RF lighting devices operating on or close to the same frequencies as those used for reception by Globalstar user terminals in elevated locations with emissions greater than those of microwave ovens constitutes a radical change in the Globalstar system operating environment. Permitting the fielding of the Fusion devices without restricting emission levels could restrict the operation of the Globalstar system wherever these RF lighting devices were in use.

5. Unlike the rare dropped call that might result from interference from microwave ovens, the deployment of Fusion lamps would likely have an adverse effect on signal quality over large areas near these lamps as calculated in the following.

It is assumed for the purpose of these calculations that the RF lighting device is mounted at a height of 10 meters and has an Effective Isotropic Radiated Power of 15 watts and performs as if the emissions emanated from an antenna with hemispheric coverage equivalent to a gain of 3 dB with respect to an isotropic radiator (dBi). It is assumed that the Globalstar user terminal is at a height of 1 meter and has a gain of 2.5 dB with respect to an isotropic antenna.

The accompanying graph indicates the power level that would be received by a Globalstar user terminal due to emissions from the RF lighting device as a function of distance from the device. The Hata propagation model as explained in International Telecommunications Union Radiocommunication (ITU-R) Recommendation P.529-2(1995) has been used in these calculations. This model